

We claim:

1 *Sub A3* 1. A well logging system comprising:
2 (a) a downhole well data sensor;
3 (b) a downhole data transmitter;
4 (c) a surface data receiver; and
5 (d) a data transmission cable linking the transmitter and the
6 receiver, the cable having at least one pair of insulated
7 conductors wound in a substantially helical twist, an
8 insulation sheath surrounding the twisted pair of conductors
9 and a tensile load carrier surrounding the insulation sheath,
10 the load carrier comprising a sheath of tensile load carrying
11 filaments.

1 2. A well logging system as described by claim 1 wherein the
2 transmitter and receiver each includes a signal modem
3 complimentary to each other.

1 *Sub C1* 3. A well logging system as described by claim 2 wherein the modems
2 utilize data encoding and decoding methods selected from the group
3 consisting of (i) QAM, (ii) CAP, and (iii) DMT.

1 4. A well logging system as described by claim 1 wherein the filaments
2 are distributed about a perimeter of the load carrying sheath in radial
3 layers.

1 5. A well logging system as described by claim 2 wherein wire size
2 respective to filaments in outer radial layers of the sheath are
3 greater than those of interior layers.

1 7. A well logging data cable comprising :

4 (b) an insulation sheath surrounding the twisted pair of
5 conductors; and

6 (c) a tensile load sheath surrounding the insulation sheath, the
7 tensile load sheath comprising a plurality of filaments.

1 8. A data cable as described by claim 7 comprising at least 6 twisted
2 pairs of conductors disposed around a center conductor, all
3 conductors being within the insulation sheath.

1 9. A data cable as described by claim 7 wherein the filaments are
2 distributed about a perimeter of the tensile load sheath in radial
3 layers.

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1 10. A system as described by claim 1 wherein the sensor is selected
2 from the group consisting of (i) a pressure sensor, (ii) a temperature
3 sensor and (iii) a flow sensor.

1 11. A data cable as described by claim 7 having an effective
2 capacitance between the twisted pair of conductors of less than 30
3 pF per foot of cable length.

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2 12. A method of transmitting a signal from within a well borehole to a
surface location comprising:

3 (a) transmitting the signal with a downhole data transmitter;

4 (b) conveying the signal on a data transmission cable linking the
5 transmitter and to a surface receiver, the cable having at
6 least one pair of insulated conductors wound in a
7 substantially helical twist, an insulation sheath surrounding
8 the twisted pair of conductors and a tensile load carrier
9 surrounding the insulation sheath, the load carrier comprising
10 a sheath of tensile load carrying filaments.

1 13. A method according to claim 12 wherein the transmitting and
2 receiving the signal are accomplished using complimentary signal
3 modems.

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- 1 14. A method according to claim 13 wherein the signal is encoded and
2 decoded using decoding methods selected from the group
3 consisting of (i) QAM, (ii) CAP, and (iii) DMT.

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